

22409

23242

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE of the following :

5 × 2 = 10

- (a) Define absolute viscosity and kinematic viscosity, also write its SI units.
- (b) Define average velocity and point velocity.
- (c) List out energies associated with flowing fluid, also write their SI units. (any two)
- (d) Name any four pipe fittings.
- (e) Give merits of positive displacement pump. (Four points)
- (f) Name any two vacuum generating equipments.
- (g) Give difference between Ideal fluid and Actual fluid. (Two points)

2. Attempt any THREE of the following :

3 × 4 = 12

- (a) Define compressible fluid and incompressible fluid. Give one example of each.
- (b) State the difference in calculation of velocity using a pitot tube and venturimeter. Give the formula to calculate velocity using a pitot tube and venturimeter.
- (c) Give the specific applications of (i) Tee (ii) Elbow (iii) Socket (iv) Plug.
- (d) Describe with neat diagram, working of a screw pump.



3. Attempt any THREE of the following :**3 × 4 = 12**

- (a) Explain Reynolds experiment with the help of a diagram.
- (b) Derive expression to find out discharge of a liquid flowing through an orifice plate fitted in a pipeline.
- (c) Draw the diagram of a non-return valve fitted on a vertical pipe. Give the application of Non-Return Valve (N.R.V.).
- (d) Distinguish between Blower and Fan on the basis of (i) Speed (ii) Pressure developed (iii) Flow rate (iv) Efficiency.

4. Attempt any THREE of the following :**3 × 4 = 12**

- (a) The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.

Data : Density of Mercury = 13,600 kg/m³, Density of water = 1000 kg/m³

- (b) Water flows through a 25 mm diameter pipeline at a rate of 0.8 litre/s. If the temperature of water is 303 K, determine the type of flow. At 303 K the density of water is 996 kg/m³ and the viscosity of water is 0.8 mPas.
- (c) Give the reason that justifies the rotameter is called as variable area meter with suitable diagram.
- (d) Compare reciprocating compressor and centrifugal compressor on basis of following points :
 - (i) Pressure
 - (ii) Pulsation
 - (iii) Efficiency
 - (iv) Maintenance Cost
- (e) Explain the concept of air binding and priming in centrifugal pump.

5. Attempt any TWO of the following :**2 × 6 = 12**

- (a) A liquid is flowing at the rate of 20 litre/s through a 2 cm dia. pipe. Density of liquid is 870 kg/m^3 . Calculate :
- (i) Mass flow rate in kg/s
 - (ii) Average velocity in m/s
 - (iii) Mass velocity in $\text{kg/m}^2 \cdot \text{s}$
- (b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1.2 m diameter at high end to 0.6 m diameter at the low end. Water is flowing at a rate of 90 litre/s. If the pressure at the high end is 68.67 kPa, find the pressure at the lower end. Neglect the losses.
- (c) Describe construction and working of centrifugal pump with the help of neat labelled sketch.

6. Attempt any TWO of the following :**2 × 6 = 12**

- (a) A venturimeter is to be installed in a 100 mm diameter line to measure the flow of water. The maximum flow is expected to be $73.8 \text{ m}^3/\text{h}$. The mercury is to be used as a manometric fluid and the corresponding manometer reading is 1.27 m of mercury. Find the throat diameter required for the venturi.

Data : Density of water = 1000 kg/m^3 ,

Coefficient of venturimeter = 0.98

Sp. gr. of mercury = 13.6

- (b) Sulphuric acid of strength 98% is to be pumped for a distance of 0.8 km through a 50 mm i.d. pipe at a rate of 3.0 kg/s and then raised vertically 15 m by the pump. The efficiency of the pump is 50%. Find the power which will be required for this duty.

Data : Sp. gravity of acid = 1.65

Viscosity of acid = 8.6 (mN.s)/m^2

- (c) Describe with neat diagram, construction and working reciprocating compressor.
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